

OXC - 2530
Copy 1 of 7

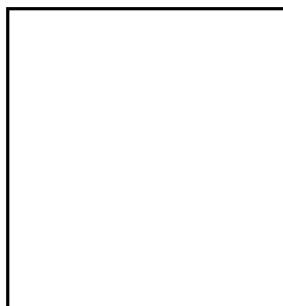
27 October 1961

MEMORANDUM FOR THE RECORD

SUBJECT : Trip Report to LAC

1. A trip was made to Lockheed on 12 October to review and resolve the OXCART rendezvous problem. Present at the meeting were the following:

25X1A



DPD
DPD
DPD
M-H
M-H
LAC
LAC
LAC
Castle AFB

2. The Minneapolis-Honeywell proposal for rendezvous accomplishment was reviewed for the benefit of those not familiar with it. Briefly, this system would operate as follows: The KC-135 has an APN-59 radar presently installed. The A-12 would have a radar beacon installed to aid in the vehicle's acquisition by the tanker's radar. A data link transmitter would be installed in the KC-135 and a receiver in the A-12. The KC-135's radar operator would insert and transmit via the data link the range and bearing signals to the A-12. In the A-12 these signals would be displayed to the pilot via the range and bearing instruments of the I.N.S. This system has one serious deficiency which renders it unsatisfactory for use. The tanker's radar scans in a forward direction only with only a slight amount of side look. There is approximately a 120° to 150° sector to the rear of the aircraft that is blanked out. This means that when the A-12 is within this sector it would not be seen on the tanker's radar. Hence, there would be no range and bearing data available during the refueling leg, when it is needed most. For this reason the M-H scheme was discarded.

3. A second rendezvous method was then described and discussed. This method involves the use of the ARC-50 as the principal tool. A

OXC-2530

Page 2

brief rundown of the ARC-50 will be given here for those not already familiar with it. An ARC-50 consists of two major sub-systems, the Translator and the Receiver-Transmitter. The Translator performs the RF functions in both receiving and transmitting and, in addition, contains an auxiliary narrow-band, AM modulator-demodulator. The Receiver-Transmitter provides communications using noise-correlation modulation and performs both narrow-band modulating and de-modulating functions. In noise-correlation modulation, the narrow-band signal balance-modulates the output of a wide-band pseudo-random noise source. The resultant wide-band signal then balance-modulates a radio frequency carrier. In this process, the energy of the transmitted signal is spread over a wide-band of frequencies so that the energy per unit bandwidth is very small. The transmitted intelligence is recaptured by synchronous demodulation of the received signal using a pseudo-random noise source identical to and synchronized with the noise source used at the transmitter. The transmitted signal of this system is extremely difficult to detect without the use of an identical pseudo-random noise source. A high degree of speech privacy is provided by the use of a pseudo-random noise source capable of producing a large number of statistically independent codes.

4. The ARC-50 has two modes of operation, the narrow-band mode which permits two-way voice communication with other UHF sets such as the ARC-34 or 27, the other mode is the wide-band mode which was described above. Also, when the equipment is operated in the wide-band mode, accurate range measurements can be made between two ARC-50 sets. When the ARC-50 is employed in conjunction with a direction finder, bearing data may also be obtained. Hence, the necessary data for accomplishing a rendezvous, range and bearing, are provided by the ARC-50 and an associated direction finder.

5. The decision was made to discard the M-H scheme for rendezvous accomplishment and to utilize the ARC-50 and the ARA-25 Direction Finder for this purpose. Use of this combination will permit practically secure and non-detectable two-way voice communication, range measurement, and bearing determination, the parameters necessary for rendezvous accomplishment. Range information will be presented on a counter-type dial and bearings will be presented on an ADF needle. Range and bearing information as well as two-way voice communication may be obtained at line-of-sight ranges. Assuming the A-12 at 80,000 feet and the KC-135 at 35,000 feet the theoretical range would be approximately 650 miles. It can be seen that communications can be carried on and range and bearing data obtained at ranges far beyond the start-of-descent point which is nominally at a range of 150 miles.

OXC-2530

Page 3

25X1A

6. The original OXCART electronic configuration as proposed by Lockheed consisted of the ARC-51 UHF commo set, the ARN-41C ADF, and the ARN-58 ILS. Subsequent decisions have pointed up the inadequacy of this configuration to meet all specified requirements. The ARC-51 commo function will be performed by the ARC-50 in addition to the rendezvous function. The requirement for an ARN-58 ILS was questioned, and it appears that this equipment can be eliminated, and this function performed by the GCA radar. Mr. [] the Lockheed AR man, stated that the A-12 with landing gear extended, should be easily detectable by the GCA radar. This will be verified by tests, and if true, the ILS will be eliminated.

7. Functional requirements as dictated to Lockheed are listed here in order of precedence: UHF Radio, Aerial Rendezvous System, HF Radio, TACAN, IFF, and ADF.

(a) The UHF Radio and Aerial Rendezvous functions will be adequately performed by the proposed ARC-50.

(b) The HF Radio is intended to provide both a recall capability and a means for the pilot to report trouble. A few words of discussion are warranted here. A limited recall capability could be provided from the tanker to the A-12 by means of the ARC-50 to a range of 400-600 miles. Beyond this range however, recall would be impossible. Admittedly, there would be no means for the pilot to report trouble after the tanker had disappeared from UHF range, which raises the question, would it be reasonable to expect the pilot to spend valuable time using the radio to report the cause of trouble if indeed he could know the cause of trouble, which seems highly unlikely in an aircraft of this type, as witness the B-58 experience. Investigation by Lockheed has proved the impossibility of installing an HF radio due to lack of space.

(c) The navigation function could be performed by VOR or TACAN. Investigation reveals that the long-range Air Force navigation plan calls for the widespread use of TACAN. No more VOR stations are under procurement, hence, there will be no expansion of these facilities. However, the VOR stations presently installed will be retained as long as economically feasible. A small VOR receiver can be installed in the aircraft, but a TACAN set is too large for installation.

(d) The IFF/SIF equipment can not be installed in the aircraft due to large size and weight.

~~SECRET~~

OXC-2530

Page 4

(e) The ADF considered for installation is the ARN-41C. This is a small, lightweight equipment with a frequency range of 190-2850 KC. This equipment can be installed in the aircraft.

8. To recapitulate the above, it appears that because of space and weight limitations, it will be impossible to install the HF radio, TACAN, and IFF equipment. In this case the electronic configuration could consist of the ARC-50 and ARA-25 for UHF communications and rendezvous purposes, a small lightweight VOR receiver such as Aircraft Radio Corporation's Model 15F for navigation purposes, and the ARN-41C ADF.

25X1A



Development Branch
DPD-DD/P

Distribution:

- 1 - DB/DPD
- 2 - ACH/DPD
- 3 - C/DB/DPD
- 4 - C/SPB/DPD
- 5 - C/MS/DPD
- 6 - C/COMMO/DPD
- 7 - RI/DPD

25X1A

DPD/DE  rew

~~SECRET~~

OXO - 2451
Copy 3 of 4

13 October 1961

MEMORANDUM FOR : Chief, Development Branch, DPD-DD/P

SUBJECT : Report of Trip, 1 - 7 October 1961,
West Coast, by [redacted]

25X1

1. Visits to facilities in Burbank, [redacted] and Edwards AFB were made during subject period for indoctrination, orientation, and program review. [redacted] served as escort on 2 and 3 October. Travel was accomplished by commercial aircraft to and from Los Angeles and by contractor aircraft and rental car in the western area. The chronological sequence of travel was as follows:

25X1

- 1 October - Travel to Los Angeles
- 2 October - Visit [redacted]
- 3,4 October - Visit Lockheed, Burbank
- 5,6 October - Visit Edwards AFB
- 7 October - Travel to Washington

25X1

2. [redacted] contact was made with [redacted] and with representatives of Lockheed, E.G.&G., and [redacted] (no [redacted] were present). Comments: Primary airframe development mission is virtually complete until flight test begins. Site should be adequate for intended purpose upon completion. Personnel [redacted] consider that rotation by air is the only practicable method, including to and [redacted] as well as Los Angeles. Plans for military personnel to commute on weekends by ground vehicle should be re-examined with provision of air transport as the alternate.

25X1

25X1

25X1

3. At Lockheed, initial contact was with Mr. C. L. Johnson. Following discussions with him on our organization and the programs his organization is conducting, tours of facilities and discussions with his staff were accomplished. Comments: At the beginning of our meeting, Mr. Johnson asked what my position description was. He stated that he had requested position descriptions of all personnel in our group about three months ago from Mr. Bissell, but that he had not yet received same. My answer was, in brief, that although assigned as an airframe engineer in the Development Branch, I did not yet know all of the specific responsibilities that would be assigned to me in connection with this job title; that my assignment was

OXC-2451

Page 2

very recent and my first duties were to monitor and find out as much as possible about the technical aspects of current projects through every means available, including visits to contractor facilities for orientation and direct discussions; that I would let him know when and what specific responsibilities are assigned me at such time as they develop. In project discussions, Mr. Johnson stated that his staff has been investigating the use of J-75 engines as an interim measure on Project OXCART so that airframe development can continue into the flight test phase at an earlier date. Compatibility of these interim engines with the OXCART airframe and systems had not yet been determined at the time of our discussion. If compatible, this is a feasible and historically proven method of time saving in airframe development, although expensive. Flying qualities, airframe drag, electromagnetic radiation, and some systems operation can be defined for the lower two-thirds of the proposed performance envelope with J-58 engines. In discussions on Project IDEALIST, Mr. Johnson held forth no hope for increasing altitude capability through weight reduction or engine replacement. He stated that his group has looked into the possibility of other engines (including the J-79), but found none that would operate at high altitude as well as those presently in use.

4. Other individuals of the Lockheed working group contacted were from various phases of systems engineering, airframe construction, aerodynamics, and flight test. Comments: The OXCART program is rapidly approaching the state where flight testing is essential to further development planning. The airframe and aircraft systems designs have been well thought out but need much development flight testing since the new regimes of flight will uncover unforeseen flaws in large numbers. The fuel and control systems were discussed in detail. The control forces will be quite similar to the B-58 according to predictions and mock-up feel. There has been no test plan of any scope drawn up. This should be accomplished in outline form at least so that we can be assured of adequate planning effort. No effort has yet begun on a flight manual. This should also be started on a predicted basis and brought up to date as information is verified.

5. At Edwards AFB the Project IDEALIST program is sufficiently along to have one or two complete profile missions flown to assure validity of planning factors. In addition to Project IDEALIST, discussions on the Helio Twin flying qualities and possible alternate aircraft were held at the Main Base. Some write-ups were brought back for analysis and comparison. The failure of Helio thus far to

OXC-2451
Page 3

produce a safe two-engine aircraft with performance to meet our requirements warrants careful review to determine the propriety of continuing our support.

6. Recommendations for Action:

(a) Review plans for transport of military personnel from [] on weekends with a view to providing air transport. Personnel at [] consider this the only practicable method.

(b) Either (1) advise Mr. C. L. Johnson of Lockheed that providing him with an organizational chart and detailed position descriptions for this organization is not permissible for security reasons (if such is the case), or (2) provide him with as much of this information as is practicable within the limits of security.

(c) Approve use of J-75 engines for interim use in airframe development if they can be used.

(d) Provide the IDEALIST unit at Edwards AFB with a sample profile mission for use in finalizing preparations for the potential operational uses visualized.

SECRET

[]
Lt. Colonel USAF

Distribution:

- 1-C/DE/DPD
- 2-ACH/DPD
- 3-DB/DPD
- 4-RI/DPD

DPD/DB/[] row